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Computer programs design entire structures

An engineer anywhere in the country will soon be able to feed several pages of data into a remote computer terminal in his office and minutes later receive complete detailed design computations for a simple-span girder bridge or a high-rise building. Omnidata Services, Inc. also can design and draw plans for five miles of highway in an hour or compute and plot a large interchange in less than an hour, according to Charles P.C. Tung, chairman of the firm, and its executive vice president, David Carsen. They are working on a program that will design an entire sewerage system for a small city, from sources through treatment plant, in less than a working day.

Testing a new high-speed terminal in their New York City office last week, Tung and Carsen did a complete design for a pair of symmetrical, two-span, three-lane bridges in 29 seconds of actual processing time on an IBM 360/67 computer in Stamford, Conn., not including printout on the Univac DCT-2000 terminal. The cost is about \$400. It takes about 10 man-weeks by conventional means, says Carsen, at a salary cost of at least \$2,000.

The whole design process takes a little longer, of course. And the engineer retains control, only turning the tedium over to the computer. The designer selects the location, type and size of structure. Then he may take three or four days to develop the preliminary design. Once it's approved, he can prepare data for the computer on several 8½ x 11-in. sheets in about four hours.

One-shot design. The computer does the entire design from a single input. According to Carsen, other programs used in this country do the job in bits and pieces. The engineer may go into the computer several times to design the superstructure, then go back again to design the piers and again to do the foundation. The secret of Omnidata's program, he says, is that it can transfer deck loads to the substructure and transfer the total loads to the foundations. The computer will try out up to about 30 loading cases on the piers and footings, providing for the most critical factors.

"I haven't been able to find any better bridge programs," says Robert Löss, head of computer services for Frederic R. Harris, Inc., New York City, one of Omnidata's member clients. A subsidiary of Planning Research Corp., Los



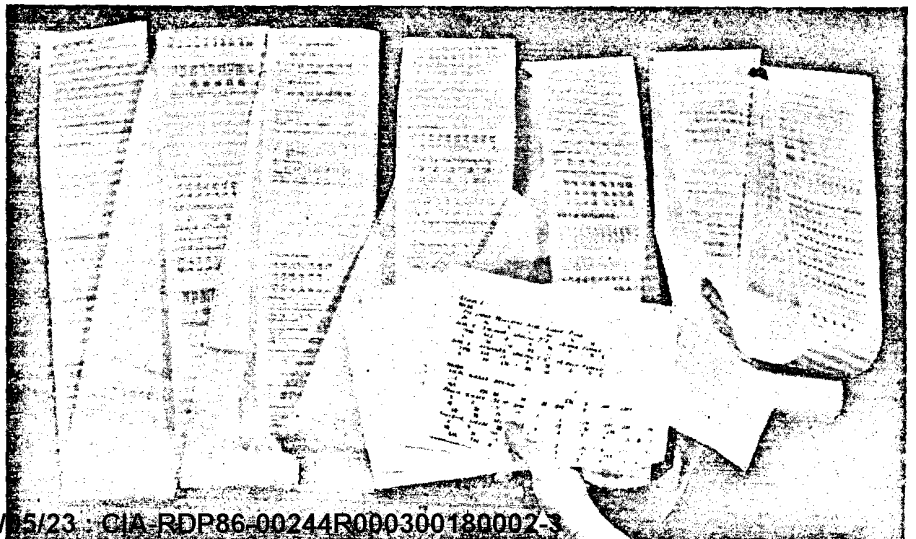
Omnidata founders, Charles Tung (r), David Carsen, developed single input programs.

Angeles, Harris uses its own computer network for highway and other structural designs. But, says bridge engineer Richard Kwok, "Omnidata's bridge program lets you get in and out quickly with the whole package. The less you have to do, the more convenient it is."

In addition to all computations needed to prepare working drawings, the computer prints out complete moment and shear figures and significant material quantities. It can also draw a bridge superstructure framing plan. In

designing a building, it can draw the framing plans and general floor plans. For highways, it designs and draws everything: profiles, sections, mass diagrams, contours and contract drawings.

To design the bridge, Omnidata uses STRUC I, its only system now on line and available to clients from remote units or using their own computers as terminals. Four other programs can be used in the office and will go on line in October. They cover geometrics, volumetrics, continuous girder bridges and



Single input fed into remote unit gives complete design computations for . . .

buildings (steel frame and working or ultimate stress concrete designs).

Other systems under development and in use by Omnidata's limited number of members handle more complex bridge and building designs, soil mechanics, water and sewer systems, and traffic and transportation plans. Another system covers payroll and accounting, estimating and construction scheduling (CPM). In addition, the firm offers a number of small programs.

What Omnidata has lacked until now are networks to carry its services close to, or into, clients' offices. The firm recently reached agreement with Western Union Computer Utility to service 13 southern states through its offices or remote terminals. Omnidata is negotiating with two other companies to cover the rest of the country.

Open club. When Tung and Carsen founded Omnidata about six years ago, they decided that the way to really service engineers and architects, while making processing profitable, was to develop integrated programs making it possible to get in and out of the computer with a complete design in less than five minutes (ENR 1/21/65 p. 51). They soon assembled a group of about 20 members, actually clients who participate in developing programs and pay a flat annual fee for all training and processing based on their number of professional employees. The original plan includes a variety of large firms, such as Frederic Harris; Louis Berger, Inc., East Orange, N.J.; Vollmer Associates, New York City.

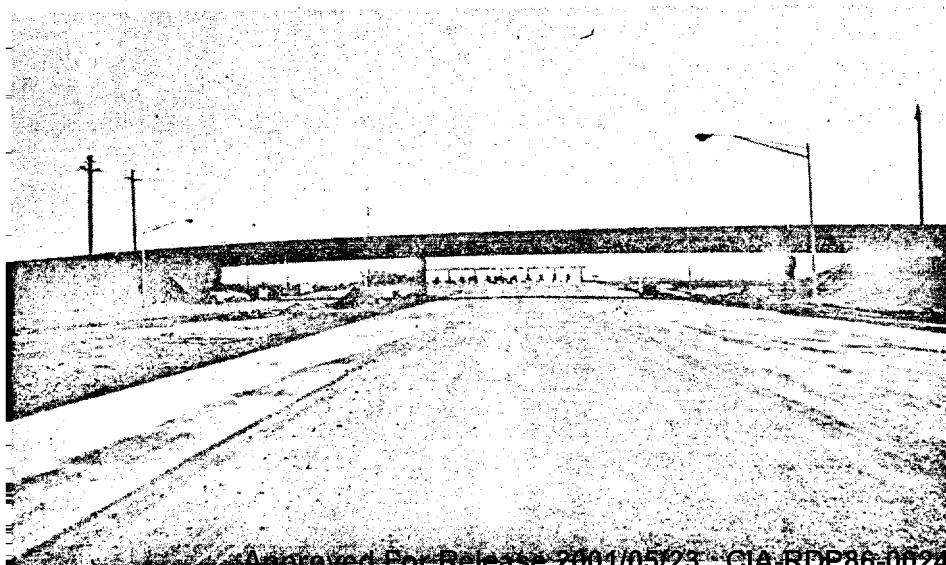
Omnidata gradually started serving nonmember clients and in January threw the gates open to all comers, charging by the job. Before a program

is made generally available, the members use it for about six months.

Most of the processing is actually done in New York on Omnidata's own 1130/32K IBM computer. On it, detailed design of the two-span test bridge takes about 15 minutes, a 30-story building requires 45 minutes. Using its standard terminals to feed the bigger machine at Stamford cuts those times to about three and eight minutes. The high-speed terminal reduces machine time (and cost to the client) even more.

Down-to-earth designs. The firm has only 15 employees, including six programmers, all registered civil engineers. Tung develops all the systems with Carsen supplying the practical engineering orientation. They stay clear of esoteric projects, tackling only the bread and butter repetitive designs that account for a great majority of consultants' work (90%, they say). Their STRUC I program handles only bridges up to four spans bearing on rock or earth. They're working on pile supported bridges now. In buildings they won't get into plastic design or thin-shell roofs until those concepts become much more common.

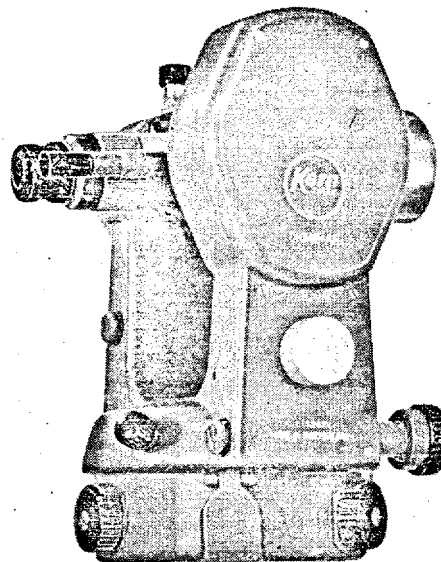
Omnidata became exclusive distributor of a sewer design program developed at Brooklyn Polytechnic Institute. They already had a program for analyzing raw sewage data and developing criteria for a treatment plant. Integrating those with structural design and equipment selection, they expect to come up with the program to design an entire system from house to outfall for a city of about 20,000. According to Carsen, Omnidata will be able to do a job in four to six hours on the computer that now takes about nine months.



... simple span girder bridge, which was designed using STRUC I system.

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